Gren

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/596,150	06/01/2006	Robert Manzke	PHDE030410US	2804

38107 7590 12/28/2007

PHILIPS INTELLECTUAL PROPERTY & STANDARDS
595 MINER ROAD
CLEVELAND, OH 44143

EXAMINER	
CORBETT, JOHN M	
ART UNIT	**PAPER NUMBER**
2882	

MAIL DATE	DELIVERY MODE
12/28/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/596,150	MANZKE ET AL.
	Examiner	Art Unit
	John M. Corbett	2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 September 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

1. Claims 1-7 and 9-19 rejected under 35 U.S.C. 102(a) as being clearly anticipated by Manzke et al. ("Automatic phase determination for retrospectively gated cardiac CT", 22 November 2004, Med. Phys. 31 (12), pp. 3345-3362).

Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

With respect to claim 1, Manzke et al. teaches a computer tomography method having the following steps:

a) generating by a radiation source a bundle of rays that passes though an object moving periodically (Figure 1, step S0 and Figure 2),

b) producing a relative movement between the radiation source on the one hand and the object on the other hand, which relative movement comprises rotation about an axis of rotation (Figure 1, step S0 and Figure 2),

c) acquiring, with a detector unit and during the relative movement, of-measured values that depend on the intensity in the bundle of rays on a far side of the object (Figure 1, step S0 and Figure 2),

d) sensing a movement signal dependent on the movement of the object with a movement-sensing means and determining cyclically repeated phases of movement based on movement signal sensed (Figure 1, step S0 and Figure 2),

e) reconstructing a plurality of intermediate images of a region of an object, each intermediate image being reconstructed with measured values that were acquired while the object was in a different phase of movement, and assigning a phase of movement to each intermediate image (Figure 1, steps S1 and S2),

f) determining the phase of movement in which there was least movement of the object in the region, by determining the intermediate image having the fewest motion artifacts in the region (Figure 1, steps S2 and S3),

g) reconstructing a computer tomographic image of the region from measured values that were acquired while the object was in the phase of movement in which there was least movement of the object in said region, the reconstruction parameters differing from the reconstructions parameters used to reconstruct the intermediate images (Figure 1, step S4).

With respect to claim 7, Manzke et al. teaches a computer tomograph, having

a radiation source for generating a bundle of rays that passes through an object moving in a cycle (Page 3354, Col. 1, lines 28-31 and Figures 1 and 2),

a drive arrangement for producing a relative movement between the radiation source on the one hand and the object on the other hand, which relative movement comprises a rotation about an axis of rotation (Page 3354, Col. 1, lines 28-31 and Figures 1 and 2),

a detector unit for acquiring, during the relative movement, measured values that depend on the intensity in the bundle of rays on the far side of the object (Page 3354, Col. 1, lines 28-31 and Figures 1 and 2),

a movement-sensing means for the sensing of a movement signal dependent on the movement of the object with a movement-sensing means, wherein the movement-sensing means includes an electrocardiograph (Page 3354, Col. 1, lines 28-31 and Figures 1 and 2),

a reconstructing unit for reconstructing a computer tomographic image of the object from the measured values (Page 3354, Col. 1, lines 28-31 and Figures 1 and 2),

a control unit (Page 3354, Col. 1, lines 28-31) for controlling the radiation source, the drive arrangement, the detector unit, the movement-sensing means and the reconstructing unit in the following steps:

a) generating by the radiation source of a bundle of rays that passes though an object that moves periodically (Figure 1, step S0 and Figure 2),

b) producing production a relative movement between the radiation source on the one hand and the object on the other hand, which relative movement comprises rotation about an axis of rotation (Figure 1, step S0 and Figure 2),

c) acquiring, with the detector unit and during the relative movement, of measured values that depend on the intensity in the bundle of rays on a far side of the object (Figure 1, step S0 and Figure 2),

d) sensing a movement signal dependent on the movement of the object with the movement-sensing means and determining periodically repeated phases of movement based on the movement signal sensed (Figure 1, step S0 and Figure 2),

e) reconstructing a plurality of intermediate images of a region of the object, each intermediate image being reconstructed with measured values that were acquired while the object was in a different phase of movement, and assigning a phase of movement to each intermediate image (Figure 1, steps S1 and S2),

f) determining determination of the phase of movement in which there was least movement of the object in the region, by determining the intermediate image having the fewest motion artifacts in the region (Figure 1, steps S2 and S3),

g) reconstructing a computer tomographic image of the region of the object from measured values that were acquired while the object was in the phase of movement in which there was least movement of the object in said region, the reconstruction parameters that are used in this case differing from the reconstruction parameters used to reconstruct the intermediate images (Figure 1, step S4).

With respect to claim 2, Manzke et al. further teaches wherein the intermediate images in step e) are reconstructed with a lower spatial resolution than the computer tomographic image to be reconstructed in step g) (Figure 1, steps S1 and S4).

With respect to claim 3, Manzke et al. further teaches wherein the region of the object that is to be analyzed is divided into a plurality of sub-regions and in that steps e) to g) are performed for each sub-region (Figure 3).

With respect to claim 4, Manzke et al. further teaches wherein, based on a motion-artifact metric, there is determined for each intermediate image a motion-artifact value by applying the motion-artifact metric solely to measured values from the particular intermediate image (Figure 4), and in that the intermediate image having the lowest motion-artifact value is determined to be the intermediate image having the fewest motion artifacts (Page 3350, Col. 1, lines 1-8).

With respect to claim 5, Manzke et al. further teaches wherein the motion-artifact value of an intermediate image is the mean of gradients of image values in the intermediate image in the direction of an axis of rotation (Page 3349, Col. 2, lines 33-37 and Page 3353, Col. 1, line 6 – Col. 2, line 1).

With respect to claim 6, Manzke et al. further teaches wherein the gradients are weighted before a mean thereof is formed, wherein a gradient that is situated in an overlap region of the object, through which region rays having acquisition times situated in different periods pass, is given a higher weight than a gradient that is not situated in an overlap region (Section 2, Automatic phase determination and Figures 4-11).

With respect to claim 9, Manzke et al. further teaches wherein the reconstructing unit determines a motion-artifact metric for the intermediate images (Figure 4).

With respect to claim 10, Manzke et al. further teaches wherein the reconstructing unit determines a motion-artifact value for the intermediate images (Equations 17-19).

With respect to claim 11, Manzke et al. further teaches wherein the reconstructing unit determines mean gradients of the intermediate images (Page 3349, Col. 2, lines 33-37 and Page 3353, Col. 1, line 6 – Col. 2, line 1).

With respect to claim 12, Manzke et al. further teaches wherein the reconstructing unit using the mean gradients to determine the intermediate image that has the fewest motion artifacts (Page 3350, Col. 1, lines 1-8).

With respect to claim 13, Manzke et al. further teaches wherein a relatively higher mean gradient is indicative of relatively increased motion artifact (Page 3349, Col. 2, lines 33-37, Page 3350, Col. 1, lines 1-8 and Page 3353, Col. 1, line 6 – Col. 2, line 1).

With respect to claim 14, Manzke et al. further teaches wherein the reconstructing unit determines the mean gradients of image values along the direction of the axis of rotation (Page 3353, Col. 1, line 6 – Col. 2, line 1 and Figure 4).

With respect to claim 15, Manzke et al. further teaches wherein the mean gradient is used as a motion-artifact metric (Page 3349, Col. 2, lines 33-37, Page 3350, Col. 1, lines 1-8 and Page 3353, Col. 1, line 6 – Col. 2, line 1).

With respect to claim 16, Manzke et al. further teaches wherein the reconstructing unit determines the mean gradients along the direction of the angle of rotation of the radiation source.

With respect to claim 17, Manzke et al. further teaches wherein the mean gradient is used as a motion-artifact value (Page 3349, Col. 2, lines 33-37 and Page 3353, Col. 1, line 6 – Col. 2, line 1).

With respect to claim 18, Manzke et al. further teaches wherein the reconstructing unit determines the mean gradient by calculating a gradient of the image values for each voxel in an intermediate image and calculating the mean of these gradients (Page 3349, Col. 2, lines 33-37 and Page 3353, Col. 1, line 6 – Col. 2, line 1).

With respect to claim 19, Manzke et al. further teaches wherein the reconstructing unit determines the mean gradient by determining gradients of image values along the direction of the angle of rotation of the source, weighting the gradients, and determining the mean of the weighted gradients (Section 2, Automatic phase determination and Figures 4-11).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 8 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Manzke et al. in view of Hsieh (6,529,575).

Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

With respect to claim 8, Manzke et al. teaches a configuration including a control unit for controlling a radiation source, a drive arrangement, a detector unit, and a reconstructing unit of a computer tomograph (Page 3354, Col. 1, lines 28-31 and Figures 1 and 2) for carrying out the steps of:

generating by the radiation source of a bundle of rays that passes though an object that moves periodically (Figure 1,step S0 and Figure 2),

producing a relative movement between the radiation source on the one hand and the object on the other hand, which relative movement comprises rotation about an axis of rotation (Figure 1, step S0 and Figure 2),

acquiring, with the detector unit and during the relative movement, of measured values that depend on the intensity in the bundle of rays on a far side of the object (Figure 1, step S0 and Figure 2),

sensing a movement signal dependent on the movement of the object with the movement-sensing means and determining periodically repeated phases of movement based on the movement signal sensed (Figure 1, step S0 and Figure 2),

reconstructing a plurality of intermediate images of a region of the object, each intermediate image being reconstructed with measured values that were acquired while the object was in a different phase of movement., and assigning a phase of movement to each intermediate image (Figure 1, steps S1 and S2),

determining the phase of movement in which there was least movement of the object in the region, by determining the intermediate image having the fewest motion artifacts in the region (Figure 1, steps S2 and S3), and

reconstructing a computer tomographic image of the region of the object from measured values that were acquired while the object was in the phase of movement in which there was least movement of the object in said region, the reconstruction parameters differing from the reconstruction parameters used to reconstruct the intermediate images (Figure 1, step S4).

Manzke et al. fails to explicitly teach a computer readable medium encoded with a computer program.

Hsieh teaches a computer readable medium encoded with a computer program (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the configuration of Manzke et al. to include a computer readable medium of Hsieh, since a person would have been motivated to make such a modification to more easily update existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

With respect to claim 20, Manzke et al. further teaches wherein the computer program controls the reconstructing unit to carry out the step of determining for each intermediate image a motion-artifact value based on a motion-artifact metric, wherein the intermediate image having the lowest motion-artifact value is determined to be the intermediate image having the fewest motion artifacts (Page 3350, Col. 1, lines 1-8).

Response to Arguments

3. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

4. As noted above, the applicant cannot rely upon the foreign priority papers to overcome the rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15. Additionally, the filing of a translation would preclude any possible rejections based on pertinent prior art cited in the conclusion below.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Manzke ("Cardiac Cone Beam CT", September 2004, A dissertation submitted in partial fulfillment of the requirements for the degree Doctor of Philosophy of the University of London, available at http://www.cardiac-ct.net/PhD_Manzke_2004_Final.pdf) discloses the claimed invention (Chapters 1 and 5).

Manzke et al. ("Artifact Analysis and Reconstruction Improvement in Helical Cardiac Cone Beam CT", September 2004, IEEE Transactions on Medical Imaging, Vol. 23, No. 9, pp. 1150-1164) discloses a method of motion artifact analysis due to gating when using a three-dimensional CB cardiac reconstruction technique (Abstract).

Manzke et al. ("Automatic phase point determination for cardiac CT imaging", 16 February 2004, Medical Imaging 2004, SPIE Vol. 5370, pages 690-700) discloses a simple and efficient image-based technique which is able to deliver patient-specific stable cardiac phases in an automatic fashion (Abstract) as disclosed by the claimed invention.

Hoffmann et al. ("Noninvasive Coronary Angiography with 16-Detector Row CT: Effect of Heart Rate", available online 18 November 2004, reference 10.1148/radiol.2341031408,

Radiology 2005; 234:86-97) discloses clinical implementation of retrospectively ECG-gated images reconstructed at preselected phases of a cardiac cycle (Abstract).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Corbett whose telephone number is (571) 272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

23 December 2007 JMC

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER